

What is claimed is:

- 1) A semi-crystalline, largely isotropic, porous coal-based product produced from particulate coal exhibiting a free swell index of between about 3.5 and about 5.0 and of a small diameter, having a density of between about 0.1 and about 0.8 g/cm₃ and a thermal conductivity below about 1 W/m/°K.
- 2) The porous coal-based product of claim 1 wherein said coal exhibits a free swell index of between about 3.75 and about 4.5.
- 3) The porous coal-based product of claim 2 having a compressive strength below about 6000 psi.
- 4) The porous coal-based product of claim 2 that has been carbonized.
- 5) The porous coal-based product of claim 2 that has been graphitized.
- 6) A method for producing a porous coal-based product from coal exhibiting a free swell index of between about 3.5 and about 5.0 comprising:
 - A) comminuting said coal to a small particle size to form a ground coal;
 - B) placing said ground coal in a mold;

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- C) heating said ground coal in said mold under a non-oxidizing atmosphere to a temperature of between about 300° C and about 700° C and soaking at this temperature for a period of from about 10 minutes to about 12 hours to form a preform; and
- D) controllably cooling said preform.

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7) The method of claim 6 wherein said coal exhibits a free swell index of between about 3.75 and about 4.5.

8) The method of claim 7 wherein said inert atmosphere is applied at a pressure of from about 0 psi up to about 500 psi.

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9) The method of claim 7 wherein said temperature is achieved using a heat-up rate of between about 1° C to about 20° C per minute.

10) The method of claim 7 wherein said controlled cooling is accomplished at a rate of less than about 10° C/min to a temperature of about 100° C.

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11) A laminated sheet comprising:

- A) a pair of skins laminated to either side of;
- B) a core of a semi-crystalline, largely isotropic, porous coal based product produced from particulate coal

exhibiting a free swell index of between about 3.5 and about 5.0 and of a small diameter, having a density of between about 0.1 and about 0.8 g/cm³ and a thermal conductivity below about 1 W/m/°K.

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12) The laminated sheet product of claim 11 wherein said coal exhibits a free swell index of between about 3.75 and about 4.5.

13) The laminated sheet product of claim 12 wherein said skins comprise a material selected from the group consisting of aluminum, steel, polymer sheet, inconel, titanium, refractory metals, fiber reinforced polymer sheet and paper.

14) The laminated sheet product of claim 12 wherein said sheet core has been carbonized.

15) The laminated sheet product of claim 12 wherein said sheet core is graphitized.